MAURY COUNTY SCHOOL BOARD

ENERGY STUDY

FOR

NEW MIDDLE SCHOOL - E.A. Cox

STUDY PERFORMED FOR

TENNESSEE VALLEY AUTHORITY

BY

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NARRATIVE

The New Middle School in Mt. Pleasant, Tennessee is approximately 113,000 square feet in area to the project. Ventilation requirements of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) were utilized in this study.

The base concept for the heating, ventilating, and air conditioning (HVAC) system is gas-fired packaged equipment and air to air heat pump systems. The gas-fired package equipment incorporates a gas-fired furnace and DX cooling coils, this equipment is to serve the core area, gym, kitchen and auditorium. The classroom wings shall utilize individual air to air heat pump units. Each system would be controlled by thermostats located in respective zones.

The geothermal system utilizes very similar heat pump equipment as the water source heat pump system except heat is rejected and added via heat exchangers configured vertically in the ground. Each heat exchanger is located in a vertical bore about 300 feet deep. The building interior water loop is circulated via pumps to the "borefield" located outside, underground. Each bore contains a 1-inch supply and return pipe. The extent or number of bores determines the overall capability to reject heat or absorb heat from the constant temperature ground soil. Thus. No boiler or cooler is needed for the water loop. All heat exchanger is confined to the borefield.

The geothermal units are capable of handling water loop temperature ranges lower than the usual water source heat pumps. This feature usually allows the heat pumps to operate at cooler refrigerant temperature which allow greater mechanical efficiencies and extended equipment life. Therefore, energy and maintenance costs are significantly less than other concepts. Also, the statistical service life of this equipment is twenty years.

We selected high efficiency water source heat pumps as manufactured by Addison with a C.O.P. of 4.0 and EER at 21 for use in the geothermal system scenario. Use of lower efficiency products would drastically affect utility cost saving.

A test bore was prepared and tested at the Mt. Pleasant project site to determine the actual ground temperature and thermal conductivity. The following results were found:

Thermal Conductivity	1.6 but/hr-ft-f
Ground Temperature	61.0 Degrees F

The above values are favorable. The computed length of bores is about 50,000 feet, requiring about 167 bores, three hundred feet deep and 20 feet on centers.